

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JAN. 1, 1951

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A YEAR



Claws for the Ground... Teeth for the Sky

The Grumman turbo-jet PANTHER, like its feline namesake, strikes swiftly and deals destruction with claw and fang. At low-level its rockets and bombs rip enemy ground installations. High in the sky, this proved Navy fighter uses its teeth! Recently over Korea, at an altitude of six miles, Red jets felt the bite of PANTHER machine guns for the first time. The bite was fatal.

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The Air Force's Convair-built XC-99 transport, with no more world cargo marks to break except her own, continues to set new records that no other aircraft can approach.

The conflict in Korea has proved conclusively that battles and even a major campaign can be lost if critical materials are not available immediately after an aggressive strike.

Commitments by the United Nations to stop aggression throughout the world emphasize the desperate need for high-capacity, long-range air-cargo-carriers that can transport vast amounts of material where and when they are needed.

Only the C-99 can speed more than 100,000 pounds of weapons or supplies anywhere in the world in time to meet the actual threat of an aggressor.

IN THE AIR — IT'S
CONVAIR

CONVOLUTIONAL PULLEY AIRCRAFT CERTIFICATION
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B.F. Goodrich



4 hot ideas for fighting ice

The pipe that flies like a plane
Designs a new Flying Boom for in-flight refueling (upper left) is specially flown into place by means of six shaped rods. To provide accurate control, these midsections had to be precision ground. B. F. Goodrich developed special electric rubber pads for the lead-rod-to-boom supply spot and long-term

Electric linkers keep new Arctic plane from freezing
Designed for Arctic rescue work, Northrops' new C-125 (upper right) had to have no protection in all vital spots. BFG electric rubber "blankets" covered the track for three parts—main rotor, elevator knee and its supports. Because of the design flexibility of electric rubber, wide variations

in the shape of these three parts proved no obstacle.

Keeps ice from choking jet's throat
Ice forming in the narrow throat of a jet engine intake could choke off the air supply, snuff the engine, quit cold. This danger has been eliminated on North American's B-70 (lower left) with a special lining of BFG electric rubber inside the cowl.

Rubber makes gasoline stretch
To help fight engineers adjust fuel supply for maximum efficiency, a hydrocarbon base monomer prepolymer lost to an environment just did. But cold was congealing the oil, causing false readings. BFG engineers showed the hydrocarbon base or electric rubber to keep

the oil fluid, use position. This bonded line is now standard on TWA Coastliner (lower right).

B. F. Goodrich electric rubber is tougher than rubber with a core of non-stretch wires that provide spot heat precisely as needed. Two lead wires attached to the airplane's regular power supply are the only other equipment required. Electric rubber can be made to fit any size, any shape airplane part. For help with your problems write to The B. F. Goodrich Company, Akron, Ohio.

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Aviation Week

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20 YEARS

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Fafnir Ball Bearing Ball Crank, one of the Fafnir Ball Bearings lightweight and heat treated to withstand large duty race ground AN-G-15, lubricate: Conforms to Army-Navy Standard Drawings

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FOREMOST IN SCIENTIFIC DEVELOPMENT

IN THE REALM OF FORGING
DESIGN AND THE DEVELOPMENT
OF PROPER GRAIN-FLOW, WYMAN-
GORDON HAS ORIGINATED MANY
FORGING DESIGNS WHICH AT THE
TIME OF THEIR DEVELOPMENT
WERE CONSIDERED IMPOSSIBLE
TO PRODUCE BY FORGING.

WYMAN-GORDON

ESTABLISHED 1933

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NEWS DIGEST

DOMESTIC

Forty-month contract was signed between Hercules Standard division of United Aircraft Corp. and Lodge 743, International Assn. of Machinists after less than one week's negotiation. Contract provides 14 cent hourly wage increase, 1-cent hourly cost-of-living allowance tied to Dept. of Labor's Consumer Price Index, 4-cent hourly increase for unemployment, increased vacation-day provision and revised group insurance program.

Less, Inc., Grand Rapids, Mich., has been awarded additional Air Force contracts for the company's P-5 supersonic and automatic approach complex (see p. 35). These contracts, totaling more than \$5-million, increase Less's backlog to over \$25-million. Meanwhile, Honeywell Regulating Co. has signed a three-year licensing agreement with Laid, Inc., to manufacture both the Lear J-85 turboprop and vertical goos in design for the Air Force. MHI has not completed delivery to Navy of last of several recently modified planes equipped with automatic landing and cruise control systems.

Lockheed Aircraft Corp. has leased facilities of Palmdale Airport in Los Angeles county as a primary point. Plans say that Palmdale are to be lengthened to 11,000 and 13,000 feet.

Link Aviation, Inc. has announced that it has received a letter contract from the USAF for building trainers simulating the Boeing B-47. Total value is approximately \$1 million; deliveries are scheduled for late in 1951.

Adm. Emory S. Land, president of the Air Transport Assn., is resigning that post effective May 15, 1951, rather than Dec. 31, 1950 as reported here last week.

Air Transport Assn. has approved applications for membership from Continental Airlines, Inc., Delta Air Lines, Inc., and Reuter Airlines, Inc., bringing its total membership to 40 airlines.

Ryan Aeronautical Co. has a current backlog in excess of \$25 million, representing both aircraft and engine components. Among the latter are jet engine parts for General Electric and engine systems for Pratt & Whitney and Douglas.

Tecon World Airlines has placed fleet order for Collins Radio Co. Type 11A-3 VHF transmitter. Collins has previously sold 50 production sets to supporting aircraft owners; plans to manufacture 250 sets in present production run with deliveries scheduled for February or March.

INTERNATIONAL

South African Airways has sold four of its eight Viking Vikings to British European Airways. Plans become real plus after SAA Canberra took over the Johannesburg-London run from Sky master, which in turn took over some of the Viking routes.

South African Air Force has decided to obtain two more de Havilland Vampire jet fighters, double the present number in service.



ADMIRALTY PRESIDENT R. W. Richardson (left), who occupies the Aviation Fuel unit of Goodhue Tice and Babler Co. was elected president of the American Petroleum and Manufacturers Assn. at its recent Los Angeles convention. With Richardson are CMA Administrator Donald Nyrop, G. B. Van Dusen, former president of AIPMA and president of Van Dusen Aircraft Supplies, and J. S. Stewart, CMA Regional Administrator, 6th Region.

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ADJUSTABLE
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Write for Bulletin 125

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W. P. AIRCRAFT CO., Inc.
WEST TRENTON, NEW JERSEY



AVIATION CALENDAR

Jan. 2-7, 1971—Miami Aviation Week,
Miami, Fla.

Jan. 14—Third annual Kansas aerial spray conference, engineering lecture hall, Kansas State College, Manhattan, Kan.

Jan. 6-7—Florida Air Plant Assn. at show and exposition of plants and equipment, Opa Locka airport, Miami, Fla.

Jan. 27, 1914, 2825.—First spring stocked at the Northern California Seeding Area, Warm Springs Airport. White End Kall, contact contractor, Warm Springs Airport, Warm Springs, Calif.

Jan. 6-13-Eighth annual air cruise Miami-Havana, and return, of Florida Air Fleet Army.

Jan. 3-12--(191) annual meeting of the Society of Automotive Engineers, Hotel Buck Cadillac, Detroit

Box 534—Third annual Institute of Industrial Transportation and Traffic, Washington, D. C.

Jan. 23-24 Plant maintenance show and
seminar conference on plant main-
tenance techniques, Cleveland, Ohio

Jan. 21—Air education day, sponsored by the Palm Springs Junior Chamber of Commerce, Palm Springs Airport, Calif.

Jan. 22-28.—Winter general meeting, American Institute of Electrical Engineers, Hotel Statler, New York.

Jan. 19-Feb. 1—11th annual meeting of the Institute of Agricultural Sciences, Hotel Astor, N. Y.

Feb. 12—Annual spring management conference, sponsored by the Society for Advancement of Management and Northwestern University Continental Congress, Chicago Campus, Northwestern University, Chicago

Feb. 19/20—Spring coverage agricultural research as related to evolution, sponsored by the Young Farmers of America, Minneapolis.

Mar 12-13—Short course on uses of aerial equipment in agriculture, Purdue University, West Lafayette, Ind.

May, 14-15th annual Right procedure meeting, Institute of Anesthetic Services, Hotel Carter, Cleveland

Mar. 1925—Seventh Western Metal Exposition, Oakland Auditorium and Exposition Hall, Oakland, Calif.

Apr 24-26—ATA annual engineering and maintenance conference, Hotel Osaka, Chicago

May 17, 1970—Annual convention of the Women's Association Am. of the U. S., Little Rock, Ark.

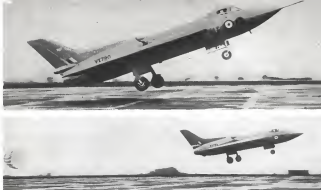
June 11-15—General annual conference on infantile amnesia, conducted by Columbia University Dept. of Industrial Psychology.

June 15-July 3—International exhibition displays, Grand Palais and La Bourdonnais Ave.

Sept. 214.—Three annual Anglo-American Antismoking Conferences commenced at

PICTURE CREDITS

8—(left) Condor photos; (right) left Adm. Woodfill (air rig); Middleman (the World News); 10—Condor; 11—Banding Airplane Co.; 12—Overcast photo; 13, 14—Ball air; 15—Crew; 16—Middleman (the World News).



New Pictures of Foreign Planes



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WHO'S WHERE

In the Front Office

Ralph J. Gaudin has been elected president of General Electric, succeeding Charles E. Wilson who has been appointed chairman of the new Defense Mobilization Board. Gaudin, who has been with GE for 24 years, has been executive vice president and a director since 1949. During the last year he was director general of war production engineering and tool division at WPA. Wilson, with GE 31 years because previously in 1949, left GE with WPA since 1942 until 1944 becoming executive vice chairman.

Leonard L. Kuhn has been appointed as vice president of General Electric. Kuhn was with GE since 1933, he has been production control manager at the laboratory and executive secretary of GE since 1942.

What They're Doing

A. H. McComb again, executive general of the International Civil Aviation Organization has left ICAT to take a permanent post in Australia. McComb will be one of ICAT's original members.

Edith Armstrong, executive vice president public relations for Trans World Airlines has joined the New York office of Executive Research, Inc., public relations counsel. He will handle the TWA's new service.

Ben Wright has been appointed director of public relations of American Airlines to take over executive position with Field & Stream magazine. He joined American Overseas in 1946.

Earl has been named as executive vice president of the AA after five years of service.

Robert C. Shonack has left North American Airlines to set up an engineering firm, the Delta Engineering Co. 215 E. Lincoln, Dept. Supply 1816, Chicago, which will do design and test representing on contract to the industry.

Chairmen

A. F. Park has been made general sales manager of Vickers, Inc. **David Chasels** has joined the new assembly department at General Motors.

Harry A. Vaughn has been appointed manager of manufacturing at General Electric's Victor and Instrument division at Los Angeles. **Donald M. McComb** has been made general manager of the Bell Aircraft Division of Bendix Aircraft Corp.

Frederick S. Bush, Jr. has been appointed general manager of the new American World Airways. **Walter** has been appointed general manager of the new American World Airways.

John F. Forth has been named manager of general sales development for TWA.

Honors and Elections

Robert E. Grant and **Donald Douglas**, president of Lockheed Aircraft and Douglas Aircraft, respectively, have been made members of the Federal League of Honor.

Frederic H. Reppert, vice president in charge of sales for Chrysler Ltd., has been awarded the Royal Order of Knight of the Dannebrog by the King of Denmark.

INDUSTRY OBSERVER

Webb notes that North American Airlines' first tabulating plane will be a new lower version of the North American A-100. It will be a new lower version of the North American A-100. It will be a new lower version of the North American A-100. It will be a new lower version of the North American A-100.

Plans of the RAF to build a new transport plane, the first delivery flight of approximately 9000 miles from London to Singapore, crossing the Atlantic at approximately 150 mph and arriving within 10 days of scheduled arrival time, on what is claimed to be the longest jet-flight delivery flight made by any air force.

General Electric has embarked on a program of "redefining" work in preparation for volume production order of "new" business. This program involves a step-by-step scheduled production of the General Electric (GE) program being first and second order flight tests.

A-100 work has been reduced from \$25 million to \$15 million in the last 10 days. Company officials state it is a result of post-Korea orders to post production. The company is bringing up its second order as quickly as possible and expects to have a third order coming in by Feb. 15. A second order, which would undoubtedly cover something over 100,000, is not scheduled for completion until next June or thereabouts.

ASAC materials experts predict replacement of aluminum with titanium in many structures in three to five years. Some Washington experts are not so sure, however, holding that titanium may be introduced within the next two years, depending on early expanding materials needs during that period.

First Republic F-44F equipped with the British-built 7380 lb thrust and two Supplemental jet engines will be ordered Feb. 1. About 100 of these aircraft have been ordered from Armstrong Siddeley for use in the F-44F. British warplane was made to provide production and testing of Supplemental F-44F before Curtin Wright can get into production with U.S. version.

At Air Force request, negotiations between Republic Airlines Corp. and General Motors Corp. for construction of the Republic F-44F are under way. USAF contractants to North Atlantic Treaty nations for F-44F are heavily increased production schedules elsewhere. TWA has about 100 F-44F aircraft scheduled for delivery to MESA nations. Production schedule delivery of more than 900 by Jan. 1, 1955.

Two of Britain's latest jet fighters, the Venoms and the Hunters F-100, are equipped with "boundary layer" to improve production rate of the jet at very low and very high subsonic speeds. Equipment is similar to that used on several of the latest U.S. experimental jets. The former retract airfoil over wingtip using a flap. Air moving along the edge of the wing towards the wing tip causes a dragless wing tip stall effect.

French F-44F is ready to be fitted with its two French jet which are to be delivered shortly. Test flights are scheduled shortly.

Rolls Royce Tye, British 5250 lb thrust contrast engine, is to be built in France under license to the Hispano-Suiza company. French sources say that the Tye fuel consumption is almost the same as that of the R.R. Tye, also being built in France, and that Hispano-Suiza hopes to increase the thrust of the Tye to 6000 lb.

age areas, government control over airway development, safety, and Security. Armed Services Committee will start up hearings with an eye to improving the Draft Law.

As far as its own work is concerned, Congress expects to push through, either in the closing days of the 91st, or early in the 92nd Congress legislation for:

- **New agencies.** The Administration will be given authority to propose as that Director of the Office of War Mobilization, Charles Wilson, will have a free hand to set up new defense agencies and coordinate the work of existing agencies. CDMC is a new vehicle for an organizational plan.
- **Governance contribution.** The plan to require the Federal Government throughout the country will go to Congress soon for enactment. The concept is that cases independent for defense agencies will stay in Washington, but that regional headquarters with representatives for manpower, production, power, energy, and civil defense will be established in each area.
- **War Risk Insurance.** Legislation re-structuring War Damage Corp. to offer government insurance for property damage due to war is set for early enactment. Insurance rates for each type property will be uniform throughout the country, plants or "hazard" areas won't have to pay any more than plants in "safe areas."
- **Civil Defense Administration.** CDA will be given broad authority to mobilize for homeland defense and occupying authority to direct evacuation in the event of an atomic attack. An appropriation of over \$100 million is to start the Civil Defense Program will be initiated shortly.

Airline Safety Mark

Trails That of 1949

Summing up the 1950 aviation record, the Civil Aeronautics Administrator Donald Nyrop estimates scheduled as carries 68,182,000 passengers, 608,453,000 revenue miles. Four civil accidents took 146 lives in U.S. scheduled airlines and domestic general aviation. That is a 1.4 deaths per 100,000,000 passenger miles flown, compared with only 1.0 last year.

Other 1950 facts and estimates prepared by Administrator Nyrop:

- **Domestic airfares.** Total revenue at the rate of 1.2 per 100 million miles, compared with 1.1 in 1949.
- **Of the 46,010 planes** used in business, agriculture and the largest share—10,990—were in airlines, airlines, mailers, and transporting firms.

Allison Gets Heavy T-40 Orders

Navy contracts totaling more than 200 of the double turboprop gives engine wide lead over competitors.

By Alexander McHenry

The Allison T-40 5500 hp. turboprop has recently been awarded a substantial boost in the U.S. prewarship race. It came with Navy orders for more than 200 of the engines. This is believed to be considerably larger than any other U.S. turboprop order, now on the books in pending in the near future.

The Navy orders, plus Allison's own promotional program for its competitors T-40 turboprop, favorability in the Navy. Turbopropers produced from the Navy by Allison, are giving the two Allison turboprops a lead which are setting manufacturers who find it difficult to meet.

• **Two Plans.** The Navy expects one to be installed in a fully large production order of Douglas AD-1 Skyraider attack fighters, and a small production order of Cessna 441, a 150 hp. engine for transport, which are part of the Navy's 1951 fiscal year engine program.

Approximately 20 of the Allison T-40 engines have been ordered flying trials, and will have been at sea by 1951. It is estimated that the light trials then for the Allison T-40 in the vicinity of 500 hp. Most of this flying has been done with the General NGP-1000 turbojet engine, but prototype for the T-40 turboprop will be flying in 1951. On at least one light trial engine flying trials, but has not yet flown in the air.

• **Attack Fighter.** The prototype Douglas XA-100 powered by an T-40, had made approximately 20 successful flights at Edwards AFB, Mono, Calif., and had attained an altitude of approximately 30,000 ft. in at least one of its tests. West Coast routes are, before the test program was cut short when the engine's operational place crashed at Mono (Associated Press, March 25). An investigation board was set up to determine the cause for the crash, but work.

Allison engineers have designed the T-40 to take advantage of the flexibility of powerplant performance made possible by using two separate power sections coupled together through a common gear box to form one engine. The complete engine drives dual contra-rotating propellers. But the complete propeller drives a single propeller. Allison claims that it is possible to detach one power section and operate the dual propellers from the other section, avoid the drag of a feathered propeller.

• **Cost.** The U.S. Navy advantage of the T-40, Allison engineers point out, is

that an increased engine power advantage is provided by cutting out one of the sections, and operating the other one at its most efficient power setting, since the engine has attained cruising altitude.

A major difference between operations of turbine and reciprocating engines is responsible for this economy advantage. A reciprocating engine is usually divided back to somewhere around 50 percent of its rated power for its most efficient cruising operation in the Navy. But a turbine engine drives its best fuel consumption at 70 percent or more of full power.

It follows, the Allison engineers estimate, that a single power and turbo-prop of comparable size to the T-40 could not reduce its full thrust power to a cruising power matching in efficiency the full consumption of the T-40. One unit cut out and the other operating at near full power.

Statistics made by the Allison Engineering group indicate that the only place where a single-unit turboprop-powered plane can get maximum range is at extreme altitude, where the power of the engine is reduced to altitude effect. This, they say, is the only altitude where the engine can be run at economical rates and still provide the thrust of the power section.

Any time that work, or weather, or other operating conditions, require cruising at lower altitudes, the single-unit turboprop is less efficient in range than a dual-unit turboprop in the same power category.

The Allison studies show that the advantages range to about 20 percent greater range for the double-unit turboprop.

• **Multi-engine.** In the case of a multi-engine installation, such as the Navy's flying boat, which has eight power sections, it is impossible to determine which any one of five different power settings would cut from one to five of the power sections, and still have the remaining power sections operating at their rated power.

On the case of the AD-1, where one T-40 is installed, the pilot has the advantage of two power sections, instead of one, giving an added margin of safety in the event of engine failure.

• **Dog Study.** Allison designed its T-40 to make other power section run both the multi-engine flying propellers, following the findings of a World War II jet-propeller dog investigation, on construction of the engine, and its performance. The tests showed that if each

power unit was used to power one of the contra-rotating propellers, thrust dropped off to 47 percent when one power section was out and its corresponding propeller feathered. But when such power section, supplying a pair to both propellers, it was found that the thrust amounted to 51 percent when one section was out and both propellers were driven by the other power unit.

One more argument presented by the Allison engineers in favor of the double power turbine engine, is the fact that the two power sections and individual gear represent three basic components, completely independent of each other. One of the three can be isolated as a maintenance, without halting the entire engine.

• **Operational Records.** It can be seen that the engine lead to some conclusions in engine overhaul records, requiring fewer field repairs for each engine, but the more engine and individual components are fully proven.

Since a single power section of the T-40 is identical with the T-34 power section, an interchangeability between the two engines offers some advantages in spare parts stocks. A turbine engine or conventional engine operating planes using both turboprops could save both with a single stock of spares, and with a single overhaul job.

Allison offers its experience in World War II with its T-34 turboprop engine. That showed that the service life of the engine was about 15,000 hours, and the engine was in the same condition as when it was first delivered. The T-40 engine, which field engine design could be confirmed to replacement of one or both power sections, without loss in the capability for full power to the complete engine.

With such advantages in mind, Allison is looking at the market offered by today's postwar commercial transports in prewarship companies as well as the military market.

• **Installation.** Besides the Conquester turboprop conversion which Allison sold as a demonstration, the T-40 turboprop can be installed in Lockheed and Convair's Douglas DC-4 and Martin 2-12 and 4-0, including military versions, to produce more power for short haul, the weight of engine powerplant installation. And the T-40, or combine to Allison studies can be used for similar improvement of performance of the Boeing Stearman, or its C-37 military cargo version, as the Douglas DC-3.

The Turboprop installation of T-34 engines, rated at 2770 hp. each, is expected to learn a comprehensive testing program under transport operating conditions which will be performed to recover data and conditions for the new powerplant.

The contract the company's light transport program which begins April 19, 1949, with the first flight of a T-34 engine in the form of a Boeing B-17 flying test bed plane, pointing the two Navy power plant flight by September 1, 1949. The B-17 test bed is still being used for light tests of advanced design components for the T-34 and T-40.

Principal American competitor for the Allison T-40 is the Pratt & Whitney T-34 turboprop engine which is rated at 1700 hp. and has a single power section. It is in early flight test stage, making its first flights this summer. The engine is rated at 1737 hp. test bed.

The T-34 Allison has no serious American competitor now in production in its power range. But Curtiss Wright Corp. has announced that it is working on a turbine engine for Army-powered fighter aircraft. Double Mustang and P-51, and, respectively at 1400, 2700 and 4100 hp. Of these the Double Mustang is already competitive with the T-34, but has not yet been delivered in production form. Curtiss Wright that it will build one of the turboprops as the new fighter.

Liaison Evaluation

Nears Completion

Phase I flight test of USAF's new evaluation of liaison aircraft type at Wright-Patterson AFB was completed last week with Phase II tests scheduled for completion by June 9.

Eight aircraft manufacturers, ten two built those operating intent to enter the competition, entered plans in the evaluation. Engines which were entered and which completed Phase I tests were: Ryan Navion, Helio Super 4, Cessna 150, de Havilland Beaver T-40C, Bellanca Senior Sportster, Model 115V, Cessna Conquester, A-10 H-11, and Aero Flight Aero II.

Following Phase II, Air Materiel Command will test during which to compare a series of the competitive features of its competitors. Lockheed and Convair have been selected to USAF headquarters for decision.

Military characteristics for the competition test that competing planes must be 4-place, capable of operations from small unimproved fields, include provisions for night and marginal weather flight, have a cruising speed of not less than 110 mph and a climb rate of at least 220 mph per minute. Plans selected could be either single or twin engine.

Air Force officials say that announcement of the award would not be made until about May 15, but it is expected to receive a contract for between 100 and 300 aircraft.

Flight Plans Needed In Defense Zones

CNA Administrator Donald Nyrop has warned that flight of flight plans is required for all planes entering or flying over defense administration areas over and adjoining the centers of U.S. Possibilities of a war in Japan and 500,000 miles in addition to pilot license inspection are provided for continuity, or suddenly violating the requirements.

Plans of the air defense administration areas which are small handed down in (secreted) around the atomic energy plants in the Northwest, also Chicago and Knoxville areas. Two ad adjacent areas, however, San Francisco and Los Angeles, neither two own defense administration areas from a low level about 20 miles off shore. In addition, flight plans are required to all planes entering the U.S. from Canada and Mexico.

In the internal record, planes are permitted to operate at less than 4000 ft. above the immediate terrain without special reporting, so that planes with such low altitudes, or those flying below level without position reporting. But flight plans are required in the Atlantic Pacific and international borders zones, regardless of altitude.

Plane Funds Set

For Early Passage

Second Defense Supplemental bill containing appropriations for Air Force and Navy aircraft, scheduled for 1951-52, will be for first year as it is expected to be passed through Congress in the closing hours of this session (Associated Press).

The bill, objective of the measure is to broaden the industrial base for plane production. It means \$200 million in new air building up, \$444 million in USAF and \$393 million in Navy. It also increases \$12 million additional for industrial maintenance by USAF and \$17 million additional for DoD in defense mobilization activities.

Roadable Certificate

The Amphibious combination light plane and into of Robert E. Evans, Jr., has been the first Civil Aeronautics Administration type certificate for a roadable plane with its own private and executive use.

Fulton reports he has an order for 12 Amphibious from Idaho. He says CAA has indicated that its agents will not issue a certificate for the Amphibious for its business type, however, it is budget makes this possible.



WONSAN railroad locomotive repair shops show deep scars after 23d Bomb Group raids.

Evaluation: Bombs Over Korea

Arsenals and rail centers hit by heavy raids in attempts to knock out enemy's war-making power.

The grim picture of how strategic and tactical air systematically smash an enemy's military resources is again being reported by USAF evaluation teams after month-long checks of bombed targets in North Korea.

Only five years after its first major bombing success in Germany and Japan, the USAF has again gone through the now familiar routine of intensive air operations, hitting enemy plants and proving, through the rubble, target by target.

The evidence plainly shows that U.S. air power has not lost its deadly touch. **► Plain Facts:** Destruction—dozens of its divided targets by the bombs showed how Strategic Air Command's policy of knocking out the enemy's ability to make war at the source paid off.

• **Kaesong:** One of North Korea's major steel and machine plants, hit by more than 500 tons of explosives from B-24s between Sept. 12 and Oct. 5, was a shambles, completely knocked out of action.

• **Pyeonggang Arsenal,** where more than 40,000 weapons produced shells and field guns, was a total loss after one B-24 hit it.

• **The main center for the Red's** entire Korean rail network, constantly within a mile-square area, was gutted by 554 tons dropped between July 22 and Aug. 22. The Communists fled after the first attack, evacuating their headquarters.

• **Northwest rail yards,** key links in the entire North and South Korea rail systems, completely destroyed by 356 tons of bombs, July 21 and Sept. 6.

• **Heavy Panmunjom-Busan railway** and another air terminus completely blasted the North Koreans as clearly pointed up in this study of bombing

in Wonsan. Here was located one of the largest locomotive works in the country. It was the chief maintenance facility on the main line of the North Korean rail system, extending to the east coast and connecting with Pyongyang, Seoul and Pusan yards.

The first B-24 raid failed to knock out the big shops completely, but succeeded in crippling them and curtailing work.

Plans were made to evacuate the installations. All salvaged machinery was to be loaded on four trains which

had escaped damage and then shipped south for safety. This activity was stopped in the bid when F4U fighters struck the plant, dropping bombs and firing rockets into the equipment and wrenching two of the trains.

Less than a week later, B-24s returned to pulverize the installation.

A flight of nine B-24s hit Wonsan on the morning of Aug. 10. Bombs also took the railroad station, manufacturing yards and yards where another flight landed over the Chosen Oil Refinery in the southeast section, a third blasted the locomotive repair shops.

Wonsan had had it. The damage survey showed that at least 40 locomotives and 60 or more railroad cars of every type were destroyed during the strategic raids.

► **Speedy Mobility:** SAC's scheme of keeping in active status up-to-date mobile plans for immediate departure on every one of its bases showed its value when the crisis came.

Part of its mobility is attributed to flyaway maintenance kits, carried in the planes' bomb-bays, which assure enough material being carried with each plane to keep it independently supplied in the field during its early combat operational period.

In slightly less than four months' operation, the 23d flew over 8000 tons of bombs and dropped 2000 tons of bombs in the enemy. The group suffered only one operational loss during that time when a plane crashed in the Chosen Sea, killing nine crew members and injuring three.

USAF Box Score in Korea

(June 26—Sept. 30)

What it Took . . .

Sorter	Fighter	Light Bomber	Med. Bomber	Bombers	Cargo
21,043	2634	3139	4627	6693	

Total 46,195
Tons bombs dropped: 29,119, Rounds armor fired 21,560,000.

Rockets fired: 65,172

Leaflets dropped: 21,561,000; Tons freight airmail: 15,925

Passengers airmail: 25,695; Evacuees airmail: 5441

Results:

Targets bombed: 1938.
Destroyed: 15 major strategic targets (all available), 157 enemy aircraft, 11,600 (automated) enemy troops killed.

Destroyed or damaged: 350 locomotives, 574 freight cars, 45 warehouses, 22 oil storage tanks, 107 targets and boats, 5293 vehicles.

Wounded: 33 mauling tanks.
Men: 376 bridges hit, 33 tunnels missed, 697 field guns silenced.

What it Cost . . .

USAF planes lost in action: 96 (31 fighters, 5 light bombers, 1 med bomber, 3 transports, 4 observation).

USAF operational losses: 45 (14 fighters, 12 bombers, 5 transports, 12 misc).

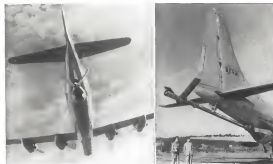
Total personnel casualties: 175 (53 killed, 58 wounded, 65 missing, 1 prisoner).



BOMBING KC-97A prototype takes a heavy succession of four Stratofreighters, its mobile scientific striking equipment.



FORMATION taking of B-24 by KC-97A shows new position of boom on both planes.



FUEL-LINE BOOM and squawks are located in rearming. There was interaction of upper and lower Stratofreighters.

Subcontracting Swells As USAF Expands

Boeing spends more than half its AF funds on outside suppliers.

The twofold increase already called for by President Truman for U.S. aircraft production this year will do more than just swell the dollar volume per taxpayer of subcontractors and parts and material suppliers in the industry. More significant, it will swell the number of these participants to the point where the cost of the program increases in the sharply accelerated production program.

Already, a substantial portion of Air Force funds is diverted by the contractor for aid in building the end product. And with participation by more sub and suppliers, still greater diversion may be expected.

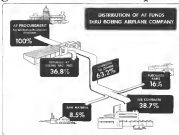
Boeing is illustrative—the extent of how widely the contractor's dollar is spread is strikingly shown in Boeing Airplane Co.'s present distribution scheme, which shows a payment to sub and suppliers of more than one-third of all funds it receives from AF awards procurement.

On the basis of this allocation, with Boeing's estimated \$1 billion backlog the payment to sub and suppliers would come to \$625 million.

Of the funds received for its aircraft production in both the Wichita and Seattle plants—the B-47 Stratojet bomber, B-50 Superfortress bombers, and the C-47 Stratofreighter transport—Boeing ends up with only 36.8 percent to apply to labor and operating costs and other expenses. The remainder (63.2 percent) is paid out to subcontractors (58.7 percent) who build assemblies to Boeing specifications and ship them to the plants for assembly into the planes, to suppliers of finished parts (3.6 percent) such as electric motor, valve, and oil cooler, and to raw material suppliers (0.9 percent) for aluminum, steel, wire and similar products.

More Participation—But this spread of funds shows what a dose with only approximately half the amount allotted for the total cost of the aircraft.

Another hard sub supplier participation is also found with composite subassembly under Government Permitted Property—engines, propellers, radar, antennas, wheels, tire flight instruments and other accessories not



HOW B-47 FUNDS are channeled to Boeing's numerous suppliers is shown here.



SHAPED SECTIONS are made in well-equipped and equipped contractors.

early purchased by the government and applied to the entire bomber for production.

Some of Sub—included in the

series subcontractors Boeing draws upon for the B-47, B-50 and C-47 projects are those well-equipped and equipped companies.



CESNA representative confer with Boeing supervisor on B-47 subassembly program.



RYAN built all portion of fuselage for Boeing is loaded on flat car for shipment.



TIMCO personnel visit Boeing at Seattle to get behind B-47 production know-how.

- Airframe Aircraft Corp.
- Beech Aircraft Corp.
- Bell Aircraft Corp.
- Boeing Aircraft Corp.
- Chance Vought Division of United Aircraft Corp.
- Cleveland Pneumatic Tool Co.
- Columbia Co., Inc.
- Consolidated Vultee Aircraft Corp.
- Douglas Aircraft Co., Inc.
- Evans Mfg. Co.
- Ford Bros. Gen. and Mach. Co.
- Goodyear Aircraft Corp.
- Ingersoll Rand Mfg. Co.
- Kelly Aircraft Corp.
- Ryan Aircraft Corp.
- A. D. Seely Co.
- Swisher Aircraft Corp.
- Tacon Engineering and Mfg. Co., Inc.
- United Aircraft Corp.
- Vard, Inc.

Boeing—subcontractors at Boeing—Wichita division, where it makes the B-47, amount to approximately 46 percent of the total airplane cost in the present. In addition, another 23.4 percent goes for outside purchase of parts and materials, bringing outside work to 69.4 percent.

Boeing's subcontractors amount to 15.6 percent of the total contracts with another 18.8 percent for parts and materials, bringing the total to 34.4 percent.

Reason for the greater volume of subcontracting at Wichita is attributed to skilled manpower limitations there and the need to avoid further burden there on the contractor's facilities. But the work is being confined, so far as possible, to the airplane and not to the engine, propeller, inspection, inspection, inspection, inspection and transportation.

Seattle, on the other hand, has established manpower and tooling built up since the end of the last war on previous contracts for the B-50 and C-47, hence, a smaller volume of subcontracting is necessary.

Cessna Halts 140 Production

Cessna Aircraft is temporarily suspending production of its little 140 two-place at Feb. 15.

Company officials give shortage of materials as the reason, adding that with the materials now available, they felt that the best way of saving this contract would be to cut back their line of models and focus output to the one-place 170 and the five-place 300 series.

The company is becoming increasingly involved in military subcontracting and has recently been awarded additional orders for its all-metal L-19 gun plane for the Army.

Negotiated Contracts

An award of \$900,000 in Writing Lease Electric Corp. for generation and the lot of negotiated contracts awarded by the Air Force for the work ended Dec. 15. The total awards received for the period were \$13,127,177.

S. Buckhorn & Co., Chicago, agency contract let, CI 190, \$150,000.
Cummins Mining & Grading Machine, Inc., Cleveland, engine engines, last award, CI 174, \$10,000.

Commercial Machine Corp., Madison, Mich., engine and spare parts, CI 65A, \$600,000.

Electric Storage Battery Co., Cleveland, second award battery, CI 611, \$215,010.
Fisher Engineering, Inc., Huntington, Ind., transformers, CI 180, \$10,000.

Gordon Electric Co., Schaumburg, Ill., apt. refrigerator, CI 602, \$10,000.

General National Battery Co., Dayton, N.Y., second battery, CI 611, \$130,100.

Gilman Mfg. Co., Union, Ohio, light engine, CI 182, \$10,100.

Jack & Winton, Pasadena, California, Inc., Cleveland, generator, CI 183, \$10,000.

K. S. Ruppel & Co., Chicago, substation and CI 157, \$10,000.

Landland Aircraft Corp., Berkeley, Calif., miscellaneous assemblies and sub-assemblies for aircraft, CI 94, \$100,000.

Marlin, Rockwell Corp., Lancaster, N.Y., ball bearings, CI 183, \$10,000.

Mundheim Mills, Inc., Los Angeles, Calif., cloth, CI 94, \$10,000.

Murphy Engineering Corp., Cleveland, furnace, electric, last award, CI 174, \$10,000.

National Union Radio Corp., Chicago, N.Y., radio tubes, CI 182, \$10,000.

Republic Aviation Corp., Farmingdale, L.I., N.Y., apt. for engine parts, CI 151, \$10,000.

Ross, Inc., San Diego, Calif., miscellaneous hardware, CI 64A, \$10,000.

Standard Thomson Corp., Dayton, Ohio, second award, CI 182, \$10,000.

Wingaluminum Corp., Dayton, Ohio, CI 182, \$10,000.

Yard & Air of the United States and Turkey Inc., Chicago, CI 182, \$10,000.

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Long Air, Inc., Dallas, Tex., CI 182, \$10,000.

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Attacker Production for the Royal Navy



STRAIGHT WINGS of British jet have been set up in assembly lines for final work on landing gear and wing fuel blowdown.



ENGINE BAT 1000 is finishing in refinery before its assembly. Jet fuel tank mounted below, and to engine case mounted at 370 ft.



FUSELAGE. Fulfilled body shell is then removed from assembly before and placed in similar station of split window trap for easy inspection in adjacent bay.



FINAL ASSEMBLY of group of four Attackers is begun. Next step is removal engine (seven to engine bay is through assembly bay through bay).

USAF Bid Information

An Awarded Contract Information is available to Air Force. When the bid is awarded, the bid is available to the Air Force. When the bid is awarded, the bid is available to the Air Force.

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AF Invitations to Bid

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PRODUCTION BRIEFING

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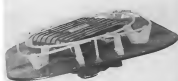
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ATTACKER (prototype shown) shown here is about 12,000 lb. Rolls-Royce Trent 600 with 10,000 lb. static thrust gives it 507 mph speed at sea level, nearly 4 ft. clearance, nearly 50,000 ft. ceiling. Walker-Airbus/Boeing/Boeing works build it.

AVIONICS



DIRECTION FINDER LOOP antenna for submerged installation to replace radio mast.

Problems of Submerged Antennas

Radiation and efficiency of conventional external types must be maintained in drag-free suppressed antennas.

[McGraw-Hill World News]

London—The external classmate of modern aircraft is aerial, generally by only one act of equipment—antenna. They protrude from the fuselage, they stick into the air to harp, they tell down and up. And they must drag. None, drag is inescapable, but it is doable. And when it comes to improving the aerial performance of an aircraft, every little bit helps. The only drag-free aerial left to consider on some of the current planes is the external system.

But for all that drag, antennas work best when they are long outside. The problem is to hide them under the fuselage without some way and still retain their efficiency.

Suppressed antennas—and suppressed is the correct terminology for saying that an aerial has been built within the plane's contours—will add something to the weight of the aircraft, but the aerial effect is still great enough to warrant the considerable research and development required.

A secondary consideration, although of importance, is that as speeds increase, it becomes more difficult to anchor any external antenna firmly.

For the Caswell-Tyler problem has been one of considerable importance to the development of the de Havilland Comet, the world's first jet-powered airliner, as well as to that of the Argonand Ambassador, one of the class-leading

of Britain's present civil aircraft. So experts of Marconi's Wireless Telegraph Co. Ltd., Chislehurst, Essex, were called in to meet on the problem.

In the paragraphs which follow, prepared especially for *AVIATION WEEK*, V. E. Hughes, of Marconi's, discusses the research and its success to date. The problem facing the aircraft designers and the wireless engineers, says Mr. Hughes, was how to provide aerials, either internally or as an integral part of the aircraft body, which would have the same characteristics, radiation properties, and efficiency as external aerials.

Designing an entirely new type of aerial to replace a type that has existed for many years, without losing any of the high performance properties of the old aerial, is not an easy task. To design a completely new range of aerials to replace old types which meet some requirements is a great many more heads have presented one of the most complex antenna problems in recent years.

Procedures for structural analysis range from 11 to 15,000 different, which automatically make different sizes of external aerials, ranging from a thin whip aerial a few inches long, to long wave communication aerials many yards in length.

► **Characteristics Aerial**—One of the first approaches was to consider the possibility of using the complete natural structure of the aircraft as an aerial to replace the conventional 200-ft trailing

aerial for communications below 20 Mc.

Since the fuselage is entirely metal, it would be necessary to insulate (the large part of) it which would be used as an aerial, but such large scale aerials too would unduly deteriorate the mechanical and structural performance of the aircraft.

It would be possible to carry the whole aircraft structure as an aerial and use a small coil internally to provide required change. If the fuselage and wings are insulated from each other and energized in counter phase of relation, the entire system which conforms, more or less, to a crossed dipole and which produces an approximate omnidirectional radiation pattern.

The nature of this method depends on having a wing area of not less than 0.2 wavelengths of the required frequency range.

Tests with this system have shown that communications can be provided over distances equal to those obtained with a free wave aerial and that the radiation pattern is almost circular.

► **VLF Aerial**—While the high impedance of the trailing aerials required a lot of power such antennas produce and have been extensively used as such a way that they offer no extra means to create drag on the aircraft. It is a most perfect whether such suppressed aerials can be used to have disappeared altogether from outside of the aircraft, but as this method, parts of the aerials can (wing tips, tail fin, etc.) can themselves be used as aerials or be made of an isolated material with the aerial close to the surface.

For example, a tail aerial for VLF communications based on this system gives a performance comparable to an external aerial of the wing type.

The best example of a buried aerial is the rotating loop for medium frequency direction finding. The Marconi type AD-1701 and AD-1702A direction finding aerials have loop aerials which being deflected means which provide sufficient picking from a shallow loop mounted at a height below the aircraft's skin.

Instead of the normal metal covering painted over the loop, machining metal is used to cover the aperture. A symmetrical arrangement of rods inside the aperture gives a vertical loop for wave determination.

Mechanical stress is applied at every point of an aerial's surface and any material external component in the structure must possess excellent mechanical as well as electrical properties

A limitation of some glass cloth covered with silver paste has proved to be the best material.

► **Cavity Resonator**—Another radiation system, slotted cavity aerials, is used for suppressing aircraft aerials.

If a rectangular slot is cut in a metal plate and filled over an exposed cavity behind it, it will radiate. A further method of energizing is by transmission line directly connected to opposite ends of the slot. If the slot is a half-wave length long of the operating frequency, it will behave the same as a half-wave dipole. If the width is small in comparison to a given wave-length, radiation is polarized perpendicular to the length of the slot.

It would not be possible to mount open slots on an aircraft as this would probably create more drag than a conventional type aerial, as the slot is small compared with the wavelength type of electric.

One of the properties of this type of aerial is that it radiates on both sides of the slot so that some method must be placed in a manner cavity to lead it must be adapted to eliminate radiation in the aircraft. This type of aerial system leads itself to many applications. For instance, an experimental means for lowering an antenna cable is obtained through a pair of slots on either side of the antenna's nose.

► **Wave Pattern**—The mechanical and structural properties of the aircraft as well as the drag which each must be carefully studied and tested plans of designing and installing suppressed aerial systems.

The physical shape of the aircraft—with its protrusions and its recesses—possesses of large bodies of metal is selected from the aerial portions and the shape of the fuselage becomes which most conforms to the contour of the aircraft, all time as effect on aerial performance. So it is possible that suppressed aerials are placed on the drawing board with the rest of the aircraft design. These plans also make it necessary for each piece of aircraft to be located separately, so a suppressed aerial designed for one type of aircraft may not be used for any other type of aircraft.

These matters had been under consideration in the Marconi research in collaboration for some time when, in November, 1946 the company was asked to join the direction of the Caswell-Tyler research in the development of suppressed aerials for the aircraft which would conform to certain design characteristics regarding properties and loading.

A slot was immediately drawn up at the rate and materials with good and was difficult to induce after one solution with the shield design.

A Lancaster fuselage was brought in

the Marconi laboratory and work at Wembley, where practical experiments were made with the full-scale fuselage, as well as with scale model aircraft.

The first list of possibilities was agreed at, there were three methods for VLF, ADP aerials and ILS aerials, two methods for VLF, and one each for Rebecca navigation aid and ADP.

All these methods were explored until the best in each group was found. It was then that the de Havilland aircraft structural engineers and Marconi was less anxious worked out final plans, the structural engineers contributing greatly to the new scheme of suppressed aerials.

For the final development stage a full-sized Comet aircraft was used and ground tests were made at the de Havilland test works at Hatfield.

The first Comet had no suppressed aerials, but was covered with suppressed aerials. On later flights various, however, a long-range HF communications suppressed aerial was fitted together with suppressed loops for the ADPs. The suppressed loops were widely a super-directional aerial.

The full Comet installation is typical of a suppressed system. The nose fin, which is made from the tail fin, is a wide-band HF antenna. The tail fin is fitted on the fin and tail plane controls the tail aerials for VLF, OBI and ILS facilities.

The HF, a grid aerial is mounted in the fin which covers the nose wheel and are themselves behind decorative flash panels. Loop aerials for ADP are mounted in the top of the fuselage and connected with electric lead wires to the tail fin. The tail fin of the ILS equipment is mounted behind the wind stream in the cockpit, while the antenna for ILS aerials, OBI and radio altimeter aerials are mounted behind the fuselage. The fuselage is the backbone of the wing and other.

High Tower for

Avionics Research

A 1200-ft high tower for the Avionics research development program has been recently dedicated at Fleet Park, near Ulm, N. Y.

The structure, approximately the height of the Empire State Building, was built primarily for development work with LORAN-T-1000 Radar Aid to Navigation—according to Col. J. A. Remick, Griffin AFB director of development research and development.

Construction is steel set in a one-story base and reinforced with concrete. Tower was built by John Ressler Construction Co., Northington, Ohio, and Wicks Engineering Co., Camden, N. J.



AN-504-1 to AN-504-5 non-connection Sparking-point type thermocouples for measuring aircraft engine temperatures. Also available in copper-constantan and in 54-316 steel for other materials.

AN-504-6 Iron-Constantan Sparking-point type thermocouple for 54-316 plugs. Wire guard and support bracket are standard and construction is protected with flexible braided stainless steel. AN-504-7 variable wire are always available to stock.

AN-504-1 Iron-Constantan Plug-type thermocouple with stainless housing in silver tip. Standard used with dual thermocouple will provide high degree high temperature.

AN-504-2 Chromel-Alumel. This type Thermocouple is built with a tapered wire constantan and a chromel wire with standard steel wire. This thermocouple is built to withstand severe jet engine service. We can replace on your equipment measuring stations.

THE LEWIS ENGINEERING CO.
Manufacturers of Complete Temperature Measuring Systems for Aircraft
NORWICH, CONNECTICUT

Pneumatics Powers New Plane Systems

Kidde develops new 4 cfm. compressor; 3000 psi. controls.

By George L. Christian

Bellefonte, Pa.—When will the first practical U.S. all-pneumatic aircraft be built? A military ship should be flying by 1975, engineers of Walter Kidde & Co., Inc., predict, and commercial operations will not be long to follow.

Pneumatics is being rediscovered as a means of actuating aircraft systems, they say.

Used twenty years ago on aircraft to operate such systems as landing gear, flaps, and trim, pneumatics in more recent years took a back seat in favor of hydraulic and electric systems.

Evidence of the growing interest in air as a means of transmitting power to aircraft systems is the evidence of all-pneumatic aircraft (the de Havilland Doves), and the fact that at least one new American jet fighter plane has been studied up with an all-pneumatic system, according to E. J. Hansell, manager of Kidde's Airline division.

Engineers of the Bellefonte, Pa., company say that, although pneumatic systems have been used in limited aircraft applications for several years, they have not been expected to take over all the aircraft they are readily capable of performing. Reason for this truly development, at least in this country, is lack of truly pneumatic equipment and know-how, observers say.

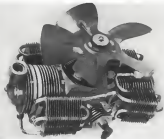
But this is rapidly being remedied. At least four U.S. manufacturers are developing considerable time, effort and research to developing the equipment and technical knowledge required to make an all-pneumatic airplane a practical reality.

From left, The Conquest Co., Minneapolis, Westinghouse Air Brake Co., Wheeling, Pa., and Kidde.

Fast, Light and Safe—Hansell told Aviation Week that the prime advantages of pneumatic systems over other means of actuation are:

- **Speed of operation.** As long as a pressure differential of 2 to 3 lb. is maintained between the air in the bottle and the actuator, the speed of air in the line approaches that of sound. As an example, gas changes operate at 1/10 sec. per example.

- **Accuracy to low temperatures.** Pneumatic systems can operate as well at



HIGH CAPACITY 4-cylinder, 4-stage, air compressor recently developed by Kidde. Fan, integral automatic pump for temperature drop. Internal mechanism is patented.

—300 deg. F., as they do at room temperature, an important feature on high-speed jet aircraft.

- **Lightness.** Although certain individual components such as the compressor may be heavier than their counterparts on other systems, the entire system is from 18 to 19 percent lighter than comparable methods of power transmission. This is due to lighter weight lines, clean system of maintenance in open systems and simplification of certain components.

- **Unlimited supply air.** In most other cases, the system can continue to operate as long as air is continuously replaceable.

- **Air is safe.** It can neither burn nor shock aircraft.

Another criticism of the desirability and diversity of pneumatic applications, according to Albert Schindler, Kidde pneumatic development engineer, is that in every Airline application of air in aircraft systems should be allowed, the ones have been so multiplied over the original concept that the system has literally "run out of air." Large compressors were needed, but none was available.

An advanced development to an air system is the difficulty encountered in detecting leaks.

- **Little by Little.**—Among first applications of air to planes were emergency operation of brakes, bomb bay doors or gear. "The systems were rudimentary and simple. A compressed air bottle, a solenoid valve, line and shutoff valve were all that was required."

During the last war certain other uses were tried with success. They were gun charging, internal bomb bay door operation, bomb release, bomb and air venting gear on Navy aircraft.

Kidde engineers point out that, on some modern bombers, bomb bay doors are operated by a 3000 psi. hydraulic system because a high capacity air compressor simply has not been available. They add that other devices are now actually controlled.

[It places pneumatic applications to date have been operation of shell ejection, gun and rocket door and automatic gun charging. The new jet fighters are loaded up in an all-pneumatic aircraft but was rejected because of lack of availability of power components.]

- **Complete Line-Up.**—Most of the Kidde line of air system accessories is the four cylinder, four-stage, model compressor (see left). Designed and developed entirely by Kidde, the unit includes a patented internal mechanism.

Features of the compressor are:



QUICK-DISCONNECT and check valve.

- **Overline.**—Four-stage cylinder to permit high capacity output at altitude. Excess air intake in at low altitudes is released through an integral relief valve.

- **Relief.**—Solenoid on last three stages, to keep air as cool as possible.

- **Compressor Specifications.**—Compressor specifications are: weight, 15.6 lb., height, 11 in.; width, 3 in.; with a 14 in. projection; depth, 14 in.; capacity at sea level, 4 cfm. at 100 psi; at 3000 psi, capacity at 15,000 ft., 1 cfm. of free air (being compressed) inlet air.

Other pneumatic components developed by Kidde for 1500 or 3000 psi systems include fuses, quick disconnect fittings, check, relief and internal valves, pressure indicators and automatic regulators.

Automatic operation consists of an automatic mechanical unit with a check-out unit added where necessary. The mechanical remote controls no moving parts and through all 99 percent of the water because of the folding machine press to the air. It automatically releases the water when the compressor stops and an optional electrical linkage allows pressure timing.

The mechanical separator is capable of drying air to a dew point of 0 deg. F. At a dew point of —65 deg. F. is desired, the chemical, after gas separator is required.

- **Design Complete.**—D. Hall, Jr., assistant manager, Airline division, revealed that Kidde had completed the design of 3000-psi aircraft pneumatic system components. A sufficient amount of air is produced multiple expansion of all sections being pneumatically operated in stored air bottles as a pressure of 3000 psi.



STORAGE BOTTLE, non-water drain.

The stored air energy is released to the operating pressure of the individual actuator which may be 1500, 300, 400 psi, etc.

Since operating lines from storage vessel to actuator carry relatively low pressure, they can be thinner walled, lighter.

Although storage bottles represent weight, their own structural members already built into an air frame capable of storing air under high pressure—compactly, loading gear struts. By using these structural parts, most of the air can be stored aboard on strength of weight.

- **Largest Program.**—The Kidde Co., whose total volume of sales last year ran over \$11 million, predicts that aviation sales will represent some 16 percent of its business this year.

It carefully surveyed the potential of all-pneumatic systems. Engineers were made of various manufacturers, of commercial operations and of the military. All reported interest, Kidde says. Its efforts to sell pneumatic unit with a "medium of results."

Confident that manufacturers and users, both military and civilian, would "buy" a pneumatic system if its components were tried and proven, Kidde set about establishing a pneumatic development program which represents the largest such program it had ever followed.

The goal is to design and manufacture a full line of pneumatic system components (compressors, valves, air modulators, fuses), but first the actuator. The air driven line cost the firm over \$300,000 in the last five years, and the end is not in sight.



BACK PRESSURE VALVE.



AIR CHECK VALVE, one of Kidde units.



PRESSURE SWITCH shows electrical connection.



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NEW AVIATION PRODUCTS



Shock Mount

A recent addition to the large family of vibration control equipment produced by Lord Mfg. Co., a long-standing expert in this field, is the "Tensar" supporting for seismic electronic equipment.

This shock mount device is made from its ability to function efficiently through a temperature range of -50 to 150 F. It is designed for use with equipment conforming to Specifications JAN C-172A. According to Lord, mountings in this series exceed the requirements of Specifications ANE-18, which requires that most parts withstand a 50G drop test.

Failure dampers in these units give excellent frequency response at moment frequencies. Mounting drift has been reduced to a negligible amount, Lord says, eliminating the tendency of equipment to sag or droop after long periods of service.

Since they function efficiently over a wide range of loadings, these mountings support a wide variety of equipment.

While they are designed primarily for use in aircraft, Lord believes they also will find use in industry, especially in applications where temperatures are above or below the range in which rubber mountings ordinarily are used.

The Hoover installation includes a right and left-hand actuator with a five-shaft drive. The unit is built to drive both landing flaps through full operating range under maximum load, even if one of the two actuators is inoperative. The attached components enable each actuator to operate the complete flap system independently in an emergency.

Hoover says the new actuator has successfully completed all vibration and flight tests. Address: 2100 Stewart Ave., W. Los Angeles, Calif.



Heating Nets

A different approach to design of heaters for aircraft and other equipment subjected to low temperatures, is represented in a heating system developed recently which can be installed without custom-wired to fit within the aircraft's wiring.

These heating elements, installed by application of conductive paste, glass and silicone coverings, are placed in direct contact with the equipment to be heated. They can be made into nets shaped like cylinders, spheres and many other odd configurations, according to the order. Electrotherm Mfg. Co., Inc. The hemispherical unit shown above is designed to heat a radar dome.

The firm says its new heating system is lighter, takes up less space and is more flexible than conventional heating pads. Little engineering consideration has to be given to fitting a heater where developing a part requiring the protection, it adds, since the film can be tailored to meet heating needs of the component after it comes off the drawing board.

Electroweave heating elements re portable operation in the ultra-low range of high efficiency wiring with densities of 150 w./sq. ft. to 150 w./sq. in. Address: 10 Rockledge Plaza, New York 18, N. Y.



Field-Tests Radar

A miniature out-of-focus weighing 17 lb., yet reportedly incorporating features found in heavier laboratory equipment, is being marketed by the Lipson Mfg. Co.

Recently ordered for this model have been placed by the Air Force and Navy, the manufacturer says. The portable unit, built to enclose single handling, is designed for checking radar equipment in the field. With its removable top locked in place, the device is weather-tight.

Noteworthy features to be found in an out-of-focus at this rate, according to its developer, are:

- Wide band and heavily features, high sensitivity
- Incorporation of direct coupled amplifiers
- Full-scale reproduction of wave forms with 5 microsecond rise time and 100% square wave

High performance of the device is the result of "conservative design to gather with the use of high-gain vacuum-tube tubes without dependence on biased circuits or peaking tubes," Hyman says.

The circuit consists of two tubes, including rectifier. Sweep frequency range of the set is 2 to more than 50,000 cps.

ALSO ON THE MARKET

Selector valve for fire-fighting apparatus has four positions making it possible to introduce into water stream air or two percent of wetting agent or a five percent concentration of foam compound. Made by Pyrotec Mfg. Co., 508 Belmont Ave., Newark 8, N. J.

Dakota utility guide for tool room and machine shops has fast-loading, unloading, 6-in. diameter wheels, quick-starting flap motor. Portables driven by battery motor, integrally cast wheel guides and adjustable tool rests. Made by Lima Electric Motor Co., Lima, Ohio.



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AIR TRANSPORT

Faith Grows in Approach Couplers

RTCA feels 100-ft. minimums are now possible with present automatic equipment, but will airlines buy it?

Anders, using autopilot and auto approach coupler already installed in some commercial aircraft, can lower their routine minimums only to 100 feet—today. That is the gist of a Radio Technical Committee for Aeronautics report going to the RTCA executive committee in February.

The question is whether airlines will buy autopilot and auto approach coupler now and get immediate lowering of operating minimums, improving vehicle reliability and safety, or will they await improved models, developing fast under the eyes of military industry and manufacturers competitors. Robert's Progress—Progress are under way by Minneapolis-Hawkeye, Lear, Sperry and Bendix among others, along with parallel work by Air Force, Navy Bureau, RAF Air Navigation Development Board and their development contractors.

Such this strong as the new ILS modifications developed by Civil Aeronautics Administration use visual distance insensitive automatic landing system. But some Air Force adherents say the Air Force-Bendix-developed automatic landing system using airborne altimeter can meet just as soon as need be another than the CAA system.

Other auto landing and approach systems in development are:

- Ground control approach radar auto-approach system.
- British "radio table" system giving more accurate landing course information.

• Minneapolis-Hawkeye autopilot and approach coupler, features pilot's angle of attack relative to stall angle with coupling to throttle control.

• Lear automatic approach attitude control.
- Better Two Human-Air Force Air Weather Flying Division eye coupling automatic approach goes in three times as common as human pilot-controlled approach under any given set of conditions.

And the RTCA committee studying auto approach recommends its use by passenger transport under 100-ft. minimums ceiling. That allows the pilot to side down through the ceiling gradually, merely maintaining his flight instruments, then to take over visual control at 50-ft. altitude.

Actually present airline operations

equipment is good almost to touch-down, but the 100 ft. ceiling is more needed for safe airline operation.

United Air Lines has said Sperry's approach is the DC-4 best and is setting standards in some DC-6s. United has had not a single case of operating malfunctions of its auto equipment, though it has been in use over a year. The company, though the auto pilot program is into approach only, is more conservative in its weather minimums. Company rule still keeps a 100 ft. minimum for the entire fleet. United seeks to lower the minimum for freight planes, leaving the requirement with the best pilots. But the pilots preferred to fly the less dependable passenger transport. So the experiment was dropped. Another United problem is that pilots say they would not go to practice on ground ILS approach.

Slow adoption of auto approach is understandable in light of several considerations:

- Speedy development of actual equipment which is required.
- Fear of anything new, especially "a remote" electronic, less understood and therefore less trusted by the old timers.
- Cost of equipment and its maintenance.

• Automatic Approach—Ever since Colson Radio Development Institute Pattern Master has been the first really promising auto approach coupler in a machine to the English Air Force in England in 1941, a small group of Air Force people have pushed development of auto approach.

Pilots were reluctant to perfect it during the war, but the first large-scale installation was the Sperry that went into some squadrons in 1947. United Air Lines took the lead among airlines about the same time.

Several other manufacturers make auto approach. The truth is much the same, except the Lear autopilot is smaller, making it and the approach coupler available to lighter planes, as well as executive and private planes.

• Automatic Landing—Two problems to be solved before perfection of a dependable automatic landing system are:

- Reducing control drag; that is, improving actual auto pilots and autopilot. The first reason needed for auto landing means more and harder

wrenches on the automatic equipment as well as airplane becomes more critical.

• Overall guidance systems devised to work automatic approach are still subject to modification. One big problem is that of controlling the rate of descent in an approach. It has been found to be better either the airborne altimeter or the ground ILS bar-out path curve.

Right now, it looks as if the Air Force-developed altimeter floor-out control is going to be the system. Question is when. The British report past satisfaction with it so it has lately been developed. British are working fast to develop a new altimeter. Air Weather Flying Division, Air Weather is doing its auto landing development with money supplied by Air Navigation Development Board.

• Program Report—ANDC has the thought of all jobs, trying to coordinate enough in many such projects and many more interests, all of which need things done their own way. But automatic landing programs are getting well, ANDC reports.

Two basic landing systems going smoothly first auto automatic landing are CAA's modified ILS systems and Air Force's airborne altimeter coupled with auto approach.

ILS systems modifications have one strong advantage over the airborne altimeter. With the ILS system modification, no new equipment need be added to the airplane or the ground except the new ILS antenna. This makes for speedy and cheap Air Force in advance program toward zero-accident.

Altimeter floor-out device developed by the Air Force has several advantages over the ILS floor-out system. The altimeter floor-out control continues to give smooth indications to touch-down area if the plane comes too low or too fast. On the other hand, ILS floor-out antenna gives a hard bang, if plane gets off the final path, it is indicated back to the end, as the only guide with the altimeter. Ground wind readings are automatically taken care of by the altimeter floor-out under development. At the power height above touch-down, the altimeter signals the auto pilot to structure the plane out of its crosswind path to true runway heading just before landing point. The present ILS system floor-out system leads the plane in a side if there is crosswind.

Any plane can use the altimeter glide-path rate landing and make the same smooth descent and touchdown. But the ILS floor path antenna signal into the auto pilot to structure the plane out of its crosswind path to true runway heading just before landing point. The present ILS system floor-out system leads the plane in a side if there is crosswind.

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Compagnia Mexicana de Aviaci3n, a
Pan American affiliate, claim to have
carried 42,091 passengers during the
past year, although this figure with
CASA statistics which are lower. In any
case, this was the bulk of the Mexican
domestic business and probably a sub-
stantial part of international traffic taking
advantage of the low domestic rates by
fly to the border.

LAMSA, the United Air Lines sub-
sidiary in Mexico, carried 33,272 passen-
gers during the year some of which was
also board international.

■ Canada-Mexico expanding commerce
of the Mexican airlines in Americas de
Mexico, also affiliated with Pan Ameri-
can. This has done most of its business
on its exclusive route to Los Angeles
Mexico City and the popular Pacific
route to Acapulco—now being used by
air.

The first, ending flights every hour
in the season, carried 124,955 passen-
gers during the past year to and in in-
crease among of Mexican domestic lines.

The business has been so good that
the line has invested in several DC-4's
which it is now using on the overseas
top with considerable success. This
year it expects to set another all-time
record in view of its new equipment.

Swissair Looks to Government Aid

(McGraw-Hill World News)

Zurich—As part of Swissair's program
to subsidize its European operations,
has obtained stockholder approval to
reduce the capitalization of the com-
pany from 28 million Swiss francs to
14 million francs. This reduction, at 6
million francs, reflects the actual losses
suffered during 1948 and expected to
be sustained in 1950. The action poses
the view for additional government aid
in financing.

The government will pay for the
two DC-4's on order by Swissair and
scheduled for delivery early next year.
The cost of these planes together with
other parts amounts to 15 million francs
(4.15 Swiss francs equal \$1). Swissair
will pay less charges on these planes
only if its profits permit, but at the
end of ten years it is obligated to re-
turn the government for the purchase
price. The DC-4's will be used as
the main Atlantic service, replacing the
DC-4's now being flown in this opera-
tion by Swissair.

In addition, the government has
agreed to pay Swissair an outright grant
of 100,000 francs annually as a subsidy
to be used for maintenance to the
company for pilot and other tech-
nical training of personnel employed by
Swissair but not employed in the
military defense of the country.

At a forthcoming session of the Swiss
parliament, the government is expected
to approve further measures to the
extent by financing a special equipment
subsidization fund. The company re-
quests that it is a few years it will be
used with the complete revolution-
ization of applying its aircraft with more
advanced types such as subsonics or
jets. It now operates 14 DC-3's, 4
DC-4's, 2 DC-6's and 4 Constellation.
The government contributes to the spe-
cial equipment subsidization fund is
expected to range from at least 3 mil-
lion to a top of about 5 million francs
annually.

ACTA Members Post Fatality-Free Year

Noted as much more members
of the Air Corps Transport Association
have not had a passenger fatality for 12
months. ACTA members could rep-
resentable membership, following the
organization of the group after the World
War II.

During the first six months of 1950,
non-scheduled carriers transported 111,
148 passengers a total of 330,167,294
passenger miles, according to Civil
Aeronautics Board records.

While fatal accidents the past year
have occurred in equipment owned by
certain members of ACTA the planes
were leased to other operators at time
of crashes, and are thus not chargeable
to ACTA member carriers.

The national carrier association po-
litical its members, holding them re-
sponsible to certain standards of qual-
ity and operation safety, as well as
financial and rate codes.

Super Connie Backlog Grows

Texas World Airlines has ordered 13
Lockheed Super Constellation for de-
livery in Spring, 1952. The plane is
designated L-1040, with 2800 hp.
Wright CA-1558 engines.

Other orders for the L-1040 are an
Lockheed Constellation, and Eastern Air
Lines 14, KLM Royal Dutch Airlines
9, Navy 11, Air Force 10, plus some
special variants for electronic work.
The military and KLM Superconstella-
tions have the most powerful Wright en-
gines equipped.

TWA's Constellation will seat 75 passen-
gers and have a luxury lounge accom-
modating seven. Gross weight is 125,
800 lb.

TWA already has 55 regular Constella-
tion. New orders for 14 Super Con-
stellations and 11 standard Constellation will build
the TWA fleet of 1952 to 75 Super
and standard Constellations.



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possibly the few pieces of "future" "control" planes. At 100 34 P.M., airplanes
of the Thermo-Micro type were well within the pilot's vision (and far
from control) of the pilot.

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types of the MRP-4 and 10 (ten) types of the MRP-5, these controls operate
for beyond the limits of human reaction. To supplement pilot control and
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Over 300 models providing filtration from 1/2 micron to 1000 microns at flow rates from 1 to 1000 cfm



SKINNER FILTERS DIVISION OF
THE MANITOWOC AIRCRAFT CO., MILWAUKEE
Bendix-Skinner Division, 900 N. S.F. Bldg.



SHORTLINES

► **Air Express**-November's \$10,515 air express shipments in and out of New York hit a new high, 7 percent over year ago. Gross revenue of over half a million dollars was up 35 percent.

► **All American Airways**-Feeder propose a fare reduction from \$6.26 to \$5.88 for Baltimore-Boston segment, from \$5.52 to \$4.65 Boston-Washington. This means a drop in connecting flight fares. Eastern says this would pay \$15.41 for trip to New York, compared with former \$16.79.

► **Air Transport Assn**-New appointment at ATA is that of Les Barker as director of operations to the operations and engineering department under new president Milton W. Arnold. Barker was formerly master director of ATA's air navigation and traffic control division.

► **American Airlines**-Big Post-Tens line beat out Colonel for naming service New York-Toronto. Nonstop, nonstop comes from Trans Canada, already established on the run.

► **Boeing International Airways**-The airline plans DC-8s to cost about \$3 million. Seating capacity is 52 passengers. Company has declared a 25 cent dividend on common stock, first since 1945. Company expects to earn net profit this year of over \$1 million—before domestic profit of over \$2 million, international loss of \$347,100, and income taxes of \$549,000 for the year.

► **Civil Aeronautics Board**-Agency has asked a group of leading aviation attorneys to recommend, among other things, a code of ethics for airman and not necessarily generally. "The process of law" requirements have left CAB powerless to do much to hasten rate proceedings, as intervenors engage in delaying tactics using the due-process machinery. So CAB has tried this back at the lawyers, asking them to act on the law. Supervising committee is CAB Advisory Committee on Procedures and Practice.

► **Colonial Airlines** - Company has started new revenues of from \$10 to \$60 a month to 250 office and station employees.

► **Lake Central Airlines**-Feeder has CAB case under order for cost per mile and after Jan. 1 of 25 cents a mile for single-engine planes, 50 cents

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for DC-3s on base mileage of \$382 miles.

► **KLM Royal Dutch Airlines**-Last offers 2 week excursions from, Europe-New York, reducing return trip ticket cost by up to 50 percent from Jan. 1-Mar. 15.

► **Mid-Continent Airlines**-Company has temporary mail row fixed by CAB at 40 cents a mile Sept. 26, 1958 to Mar. 15, 1959, 55 cents Apr. 1-June 30, 1959, 50 cents on and after July 1, 1959.

► **National Airlines**-National has started the first direct air route service between Washington and Tampa. Its plane is \$16.85, compared with \$21.75 regular fare.

► **Piedmont Airlines**-Feeder has three new side line CAB reporting. The new removal of temporary certificate Board points up company's "substantial improvement." CAB proposes, among other changes that September 1st of which be extended from Seattle, W. Va., to Lexington, Ky., on September 1, thereby giving one line service to Lexington and Lexington from Raleigh and points east. Piedmont Airlines now boasts the lowest fare interstate mail per mile (at established for any of the local service airlines)-46.75 cents per revenue mile.

► **Pioneer Air Lines**-Feeder paid a 20 cent dividend on common stock Dec. 23. Total payout is \$27,000 on the 68,800 shares, common outstanding. First Pioneer dividend was 25 cents paid Dec. 23, 1949, second was 25 cents paid Jan. 16, 1950. Company earned \$3.12 a share, or \$100,492, the first 10 months of 1950.

► **Tenn. World Airlines**-Company is offering two European tours in cooperation with Larkspur Travel Service—a combine sightseeing and visits to companies for friends and families of fallen soldiers. Its address, each member of the tour will have the right to visit at no extra cost to himself one cemetery of his choice.

► **Western Air Lines**-Line claims the fastest growth in the domestic airline field. Revenue passenger miles the first three quarters of 1958 were 49 percent over 1949.

► **Wiggins Airways**-Feeder wants to buy the Dr. Bernard Davis and the deal is already worked out but Wiggins owner by Davis under CAB allows cost not pay. Dr. Bernard has an Alouette aircraft for sale for \$100,000, with only a relatively small down payment.

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THE AIRCRAFT INDUSTRY is taking a beating whenever it has plenty. The public rails about our current state of gross mismanagement. Yet everyone who lives in the community knows first-hand or hears second-hand that plant capacity is not even being approached. Over-shift operations are common. Plant production rates are unchanged. Plant workers are not being hired in substantial numbers. "What's the matter with the aircraft people? Aren't they patriotic?" the boulevard ad.

The answer, of course, is that aircraft companies, like any other business enterprise, must receive orders in order to keep running. The number of new orders the industry has received since the President's emergency proclamation is trivial. They will be coming, but they haven't arrived yet.

Until this does, aircraft companies are powerless to do much more than keep engines and hold preliminary conferences. They can't hire thousands of plant workers. They can't go on more shifts. They can't make detailed plant arrangements to meet the needs what type they will be asked to build, or how many. The Air Force must tell them.

Before the Air Force can do that, it must know itself. The public can hardly believe it, but in the past few months the Air Force staff hasn't known exactly what kind of air war it was going to fight, so how could it allocate all of the funds it needs for materials? The Army and Navy were a drastic too. First there must be agreement among President, Treasury, the State Department, the Department of Defense and the Joint Chiefs of Staff on a new strategic and strategic plan. It has to be put together by our highest policy making. A few weeks ago it didn't exist. The old venerable and yet-Korea plan of the war at the future had to be scrapped. Of course, the new concept isn't finished yet; it will be modified constantly. But the new strategic orders and action plan for all other weapons will begin coming out in industry soon.

Until these orders arrive, and the aircraft industry gets the signal from Washington, it has no other alternative but to keep operating at the pace it was last instructed by the Air Force to maintain. This is the message we would like to tell a wondering, puzzled public.

THE IDEA OF A PANACEA for quick production of aircraft and engines by the entire industry should be quilled right now by both the military and civilian industries. The public should not be lulled into a false sense of security by the Ford, Kaiser-Frazer, Studebaker, and General Motors assembly lines the western manufacturing pattern.

Chief Aircraft's President Jack H. Rouse has put it best. He says he has "a five-fold increase in aircraft engine production in a year simply in the dock. Guess you don't get it, nor would you. It's not a matter of scale, but it's a matter of scale and gives all the machine tools we will need, the very best we can do in one year is a three-fold increase in powerplant production. If we have absolutely no bottlenecks.

As we make a steady build production increase two years from now. In the third year, after we have brought in the automotive manufacturers in bombers, and established reliable plants and trained our working force, then we can produce whatever the economy can stand. But there is no scale that can be substituted for time. We think we have a little head start, now that we have already launched Ford's good use the badly needed Westinghouse. But no matter how profitable Ford works it will be the summer of 1972. Because the Ford people can get in quantity production. Meanwhile, established manufacturers will have to carry the load."

Other auto companies too are asked for its work. This

the Administration is setting the stage for inevitable cuts in our output, but it has that far does little to take the aircraft industry into its confidence. When surrounded of this, the Air Force officials usually point out that the industry must will be given all the orders it can stand. Maybe, but we feel strongly that the Air Force and the nation have everything to gain and nothing to lose by including with the established industry. Meanwhile, once again, let's say that you production forecasts by the nation or people.

THAT OLD BOGEY CENSORSHIP seems rather needlessly, it appears, in the vicinity of Louis G. George Stokely. For the sake of more important things, like victory in Korea, we hope the Fifth Air Force Command has let his first drop over the New York Times P-56 story. The general the other day ordered a "full investigation" of the "permeable" publication of the news that a group of North American Sabers had bailed for the first time with Chassaint jets. According to the New York Times, the Times' correspondent in Korea, Stokely's office called the Times' publication of the P-56's first battle "one of the greatest violations of the war."

Readers of this page noted as recently as Dec. 16 that the Pentagon in Washington still held to the policy that information on new types of planes is a threat to classified they are in combat and their presence is thus exposed to the enemy. This was the traditional news policy in World War II, and it makes sense.

What security is broken by telling the home folks what the Communists already know? The Sabers were into combat with a covey of MIGs. Only one Red plane was shot down, all the others went home to tell about it. From this distance, Stokely's position seems surprisingly unobjectionable. Apparently the New York Times thought so too. Now like it should be approached by the Washington residents of the press and the public are not to be handicapped into unnecessary censorship.

TRANSPORTATION ADMINISTRATION OF AMERICA presents an item in Aviation Week's Washington Round-up, Dec. 11. The Administration, described there as dominated by the military, has shown almost no interest in the only to fight government control of "socialization" of all means of transportation. We are against government ownership of transport, too. But we think the TAA should start working on crew clothing and remaining open when it is no longer worthy the interests of the industry and forward.

Although it deals with special railroad interests, its latest Board of Directors has identified 38 districts as railroads or railroad equipment districts, one that could be identified with ship carriers with trucks, one with aviation (President Pittman of United Air Lines), and none with bus carriers.

Another top-off in the TAA's official bookends of income in the first three quarters of 1970. About 40 railroads to other contributed nearly \$100,000, according to the TAA's report published in the Congressional Record. Rail equipment makers, and holders of railroad equipment such as buses and locomotives companies also contributed liberally. United Air Lines' contribution is the only aviation income shown, although in the first three quarters it apparently contributed \$1000 instead of \$5000 as we reported earlier. What better way is there of taking the first measure of an aviation industry than studying (1) its head of directors, (2) the source of its income?

—Robert H. Wood



"UMBRELLAS" ...FOR A RAINY DAY!

"Unofficially" represents one of the few lines of a complete national defense system!

About three hundred of sixteen para-chutes, six Fairchild planes, a few equipped to do the job, aircraft in the store.

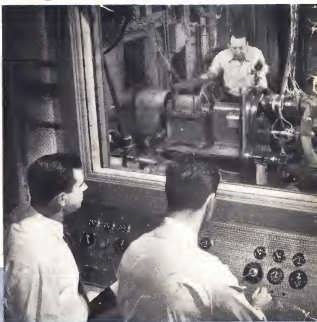
Fairchild leadership in the development of survival aircraft is now playing a vital part in the vast production modernization program. Like the air force, troops, the C-82 Packet the

C-119 Imperial Cargo and C-124 Hercules, the C-130 Hercules, the C-141 Starliner, the C-170 Hercules, the C-174 Hercules, the C-175 Hercules, the C-176 Hercules, the C-177 Hercules, the C-178 Hercules, the C-179 Hercules, the C-180 Hercules, the C-181 Hercules, the C-182 Hercules, the C-183 Hercules, the C-184 Hercules, the C-185 Hercules, the C-186 Hercules, the C-187 Hercules, the C-188 Hercules, the C-189 Hercules, the C-190 Hercules, the C-191 Hercules, the C-192 Hercules, the C-193 Hercules, the C-194 Hercules, the C-195 Hercules, the C-196 Hercules, the C-197 Hercules, the C-198 Hercules, the C-199 Hercules, the C-200 Hercules, the C-201 Hercules, the C-202 Hercules, the C-203 Hercules, the C-204 Hercules, the C-205 Hercules, the C-206 Hercules, the C-207 Hercules, the C-208 Hercules, the C-209 Hercules, the C-210 Hercules, the C-211 Hercules, the C-212 Hercules, the C-213 Hercules, the C-214 Hercules, the C-215 Hercules, the C-216 Hercules, the C-217 Hercules, the C-218 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